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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/557,698

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Masato Sumikawa

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NIXON & VANDERHYE, PC
901 NORTH GLEBE ROAD, 11TH FLOOR
ARLINGTON, VA 22203

EXAMINER

D'ANIELLO, NICHOLAS P

ART UNIT

PAPER NUMBER

1793

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DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/557,698	Applicant(s) SUMIKAWA ET AL.	
	Examiner Nicholas P. D'Aniello	Art Unit 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 November 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 12-14, 16-18 and 20-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11, 15 and 19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Newly submitted claims 23-25 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

These claims (23-25) contain limitations which define the first alloy as either a SnPb, SnBi or SnZn based alloy. The claims as originally presented included claims (claims 6-11) drawn to the preferred embodiment of the invention (described in paragraphs [0040-43] of the instant specification) where the first alloy is a SnAg based alloy. If these four mutually exclusive embodiments (the first alloy can only be one of these alloy systems) had been originally presented a species restriction would have been issued, requiring applicant to select a single species for examination on the merits because there is nothing of record to show that these are obvious variants.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 23-25 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-5, 15 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Jiang et al. (US Pub 2003/0119299 of record).

In regard to **independent claim 1**, Jiang et al. teach a conductive ball (figure 2B) comprising: a core 42 formed in a generally spherical shape and formed of a nonmetallic (polymeric) material (paragraph [0052]); and a coating layer coating a surface of the core and having at least a first metal layer (outer layer 44) and a second metal layer (adhesion promoting layer 44' or 44'' - see paragraph [0049] for adhesion promoting layer composition), wherein, the first metal layer (outer layer 44) is the outermost layer of the conductive ball and is made of a first alloy containing tin and having non-eutectic composition (such as 95%Pd and 5% Sn), and the second metal layer (adhesion promoting layer) is made of a second alloy such as nickel (see paragraphs [0049 and 0052]) wherein the first layer and second layer are in contact with each other (see, for clarification, the last sentence of paragraph [0052] - the conductive ball may comprise a core 42 that is polymeric, an outer layer of solder 44 containing tin and an additional layer, such as an adhesion promoting layer, added to the core to enhance the adhesion of the solder material thereon - where the adhesion promoting layer may include nickel as described in paragraph [0049]).

In regard to **claim 2**, the first alloy has composition in which a liquidus temperature rises when a proportion of Sn in composition decreases (see lead - tin phase diagram below).

In regard to **claim 3**, the first alloy has composition closer to eutectic composition than to a composition whose constituent forms an intermetallic compound.

In regard to **claims 4 and 5**, the first alloy has composition in which a liquidus temperature is 260°C or higher.

In regard to **claims 15 and 19**, the conductive ball is used in an electronic component (figure 1) which is used in a semiconductor assembly (i.e. electronic equipment see paragraphs [0003 and 0005]).

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 6-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang et al. as applied to claim 1 above, and further in view of Pfarr et al. (US Pub 2005/0008525 an English equivalent of PCT/DE02/04525 which published as WO/051572 on 6/23/2003).

In regard to **claims 6-11**, Jiang et al. teaches that the preferred material for the metal layer 44 is a tin or silver alloy (paragraph [0052]) but does not disclose a specific alloy composition. However, Pfarr et al. teach a silver solder alloy for similar BGA devices which has tin and a silver content between 5.0 - 5.5 weight percent because such a composition avoids the formation of coarse tin dendrites when cooling and guarantees a smooth and homogenous surface of the solder (paragraph [0031]).

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It would have been obvious to one of ordinary skill in the art at the time of the invention to use a silver alloy with between 5.0 - 5.5 weight percent silver for the silver alloy layer in the conductive ball of Jiang et al. because such an alloy has multiple benefits in electronics manufacturing art as taught by Pfarr et al.

Response to Arguments

Applicant's arguments have been fully considered but they are not persuasive. Specifically, Jiang et al. teaches the claimed structure where tin is in the outermost layer and a nickel adhesive promoting layer is in contact with the polymer core and the outermost layer as applied above.

In regard to the eutectic composition - as applicant admits, the preferred solder composition of Jiang et al. is non-eutectic; the fact that the reference is open to other compositions is immaterial as the reference specifically teaches a non-eutectic composition.

In regard to Pfarr et al. - while the reference teaches the desirability to maintain an "almost eutectic melting and solidification temperature" this does not mean that the composition is always eutectic. Pfarr et al. teaches the composition is preferably contains 5-5.5 wt% Ag - and as well known in the soldering art, the eutectic composition for a tin-silver alloy is 3.5 wt% Ag.

In other words, the "noneutectic composition" limitation is embraced by both of the references. The only scenario where this limitation would not be satisfied would be

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if the references only disclosed eutectic compositions and it was clear that having a eutectic composition was critical to the disclosure of the reference.

Additionally, it is noted that Pfarr et al. teaches the ability to add up to 20 wt% Ag (see paragraphs [0032 and 0048]) which is clearly not a eutectic composition.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Inquiries

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicholas P. D'Aniello whose telephone number is

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(571)270-3635. The examiner can normally be reached on Monday through Thursday from 8am to 5pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jessica Ward can be reached on (571) 272-1223. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. P. D./
Examiner, Art Unit 1793

/Jessica L. Ward/
Supervisory Patent Examiner, Art Unit 1793